Xradia 610 Versa 概述
Xradia 610 Versa Overview

蔡司Xradia 610 Versa主要由三部分组成：

1.带铅板防护的测量室；

2.系统控制柜；

3.数据处理工作站。

Computer workstation
数据处理工作站

Controller cabinet
电气控制柜

X-ray measurement cabinet made of lead panels

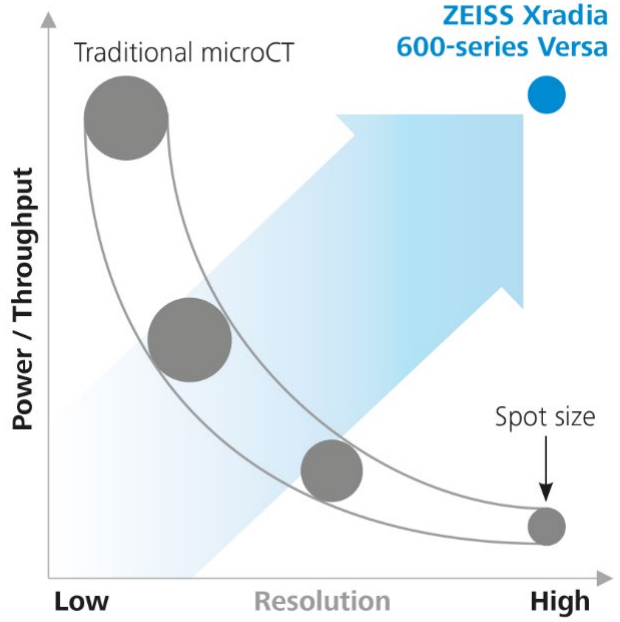
钢-铅-钢三明治结构的防护外壳，内部为运动定位系统及射线源、成像系统。

不受影响的高分辨率

由于几何放大固有的影响，常规的X射线计算机断层扫描(CT)只能够对小样品进行高分辨率成像。受长工作距离的要求限制，对于大的样品实现高分辨率成像是不可能的。此外，CT系统要实现高分辨率成像还需要具备低X射线通量，从而降低了检测效率。大多数CT制造商所声称的高分辨率与实际的应用分辨率是不符的。

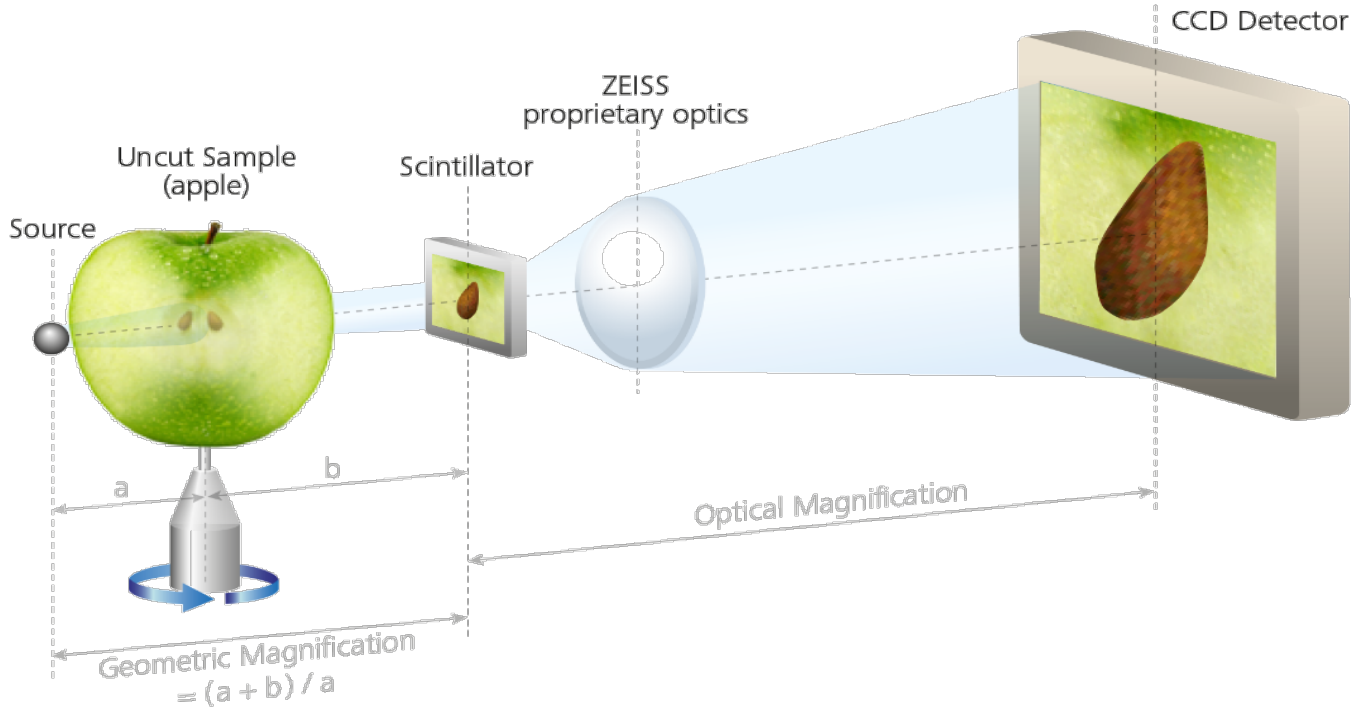
蔡司Xradia 600 Versa系列通过将两级放大架构与高通量X射线源技术相结合，解决了这些问题。

蔡司采用真实空间分辨率的概念，为衡量3D X射线显微镜性能提供了标准。空间分辨率是指成像系统能够分辨两个特征的最小距离。蔡司Xradia 600 Versa系列可实现500nm最高空间分辨率和40nm最小体素。



蔡司X射线显微镜 RaaD 的多功能优势

蔡司Xradia Versa采用两级放大技术，让您在大的工作距离下仍可以对不同类型和不同尺寸的样品进行亚微米分辨率成像，即RaaD技术。如同在传统的micro-CT中一样，样品图像最初先进行了几何放大。投影的信号映射在闪烁体上，闪烁体将X射线转换为可见光。随后，光学物镜会在图像到达探测器前对其进行再次放大。



样品成像不依赖于到射线源的距离，能对较大样品的内部进行高分辨率无损成像

Xradia 610 Versa 射线安全防护简介
Xradia 610 Versa Radioprotection Introduction

设备型号：Xradia 610 Versa

最大射线管电压：160 kV

最大射线管电流：156μA

最大功率：25W

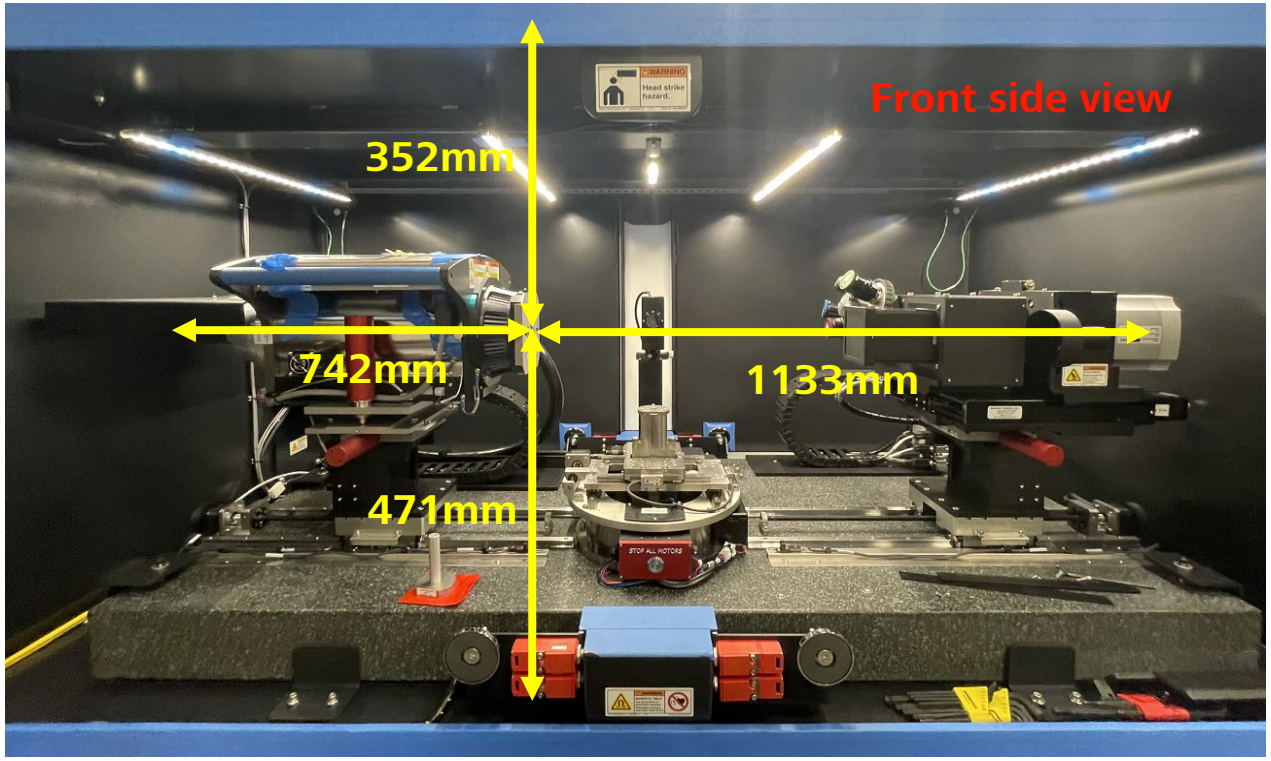
射线管类型：定向

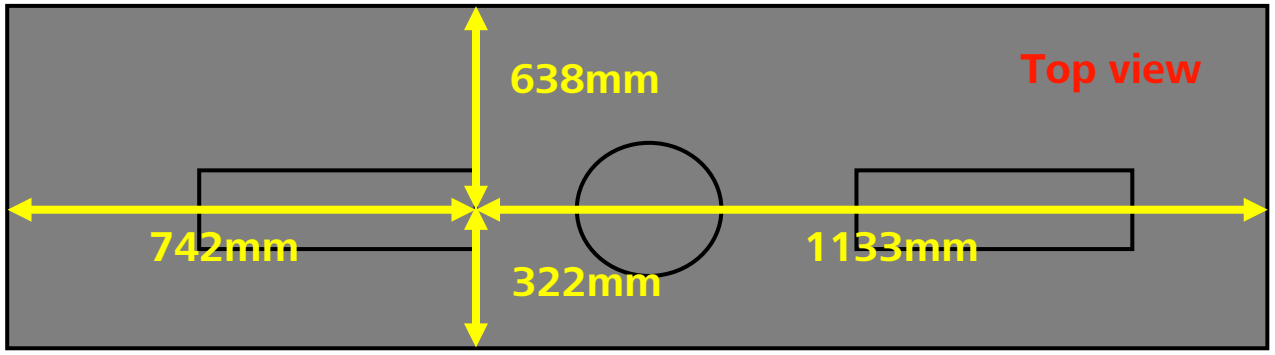
焦点尺寸：1~5μm

最大工件重量：25kg

该装置自带钢-铅-钢结构的全封闭防护外壳, 铅层由1至6mm钢板包裹以增加刚性，距辐射防护外壳表面0.05m的剂量率不超过1 μSv/h的限制值。

Xradia 610 Versa 射线安全防护简介
Xradia 610 Versa Radioprotection Introduction





如左图，从机器的正前方（操作面）来看，射线逸出口距离防护铅房各个方向的距离为：

距离右侧防护铅板（探测器侧）为1133mm；

距离左侧防护铅板为742mm；

距离底部防护铅板为471mm；

距离顶部防护铅板为352mm；

距离后方防护铅板为638mm；

距离前方防护铅板为322mm。

Xradia 610 Versa 射线安全防护简介
Xradia 610 Versa Radioprotection Introduction

如左图，从机器的正前方（操作面）来看：

1.前门防护板及厚度：中间为6mm厚度的铅板，内外侧包裹钢板，外部4mm的钢板，内部1.2mm的钢板；

2.后门防护板及厚度：中间为6mm厚度的铅板，内外侧包裹钢板，外部4mm的钢板，内部1.2mm的钢板；

3.射线源所在的右侧防护板及厚度：中间为9mm的铅板，内外侧包裹钢板，外部4mm的钢板，内部1.2mm的钢板；

4.射线源所在的左侧防护板及厚度：中间为6mm的铅板，内外侧包裹钢板，外部4mm的钢板，内部1.2mm的钢板；

5.顶部防护板及厚度：中间为6mm的铅板，内外侧包裹钢板，外部2mm的钢板，内部2mm的钢板；

6.底部防护板及厚度：中间为6mm的铅板，内外侧包裹钢板，外部6mm的钢板，内部6mm的钢板；

Xradia 610 Versa 射线安全防护简介
Xradia 610 Versa Radioprotection Introduction

The Xradia Versa is fully enclosed within a steel enclosure, which includes access doors and protective covers that provide a safety and environmental barrier. The steel and lead-lined enclosure covers and access doors:

– Provide protection from X-ray beams and high voltage generated by the X-ray source

– Maintain the Xradia Versa at operating temperature

The access doors include a fail-safe (safety) interlock. The X-ray source will turn ON only if the access doors are CLOSED.

Xradia 610 Versa 紧急关闭按钮
Xradia 610 Versa EMO

One EMO button is located on the front panel of the enclosure, within easy reach. A second EMO button is located on the back of the Xradia Versa enclosure, below the rear access doors.

机器一共有2个紧急停止按钮，一个紧急关闭按钮在正前方门的下方机柜门上，另一个在正后方门下方的机柜门上；

Xradia 610 Versa 紧急关闭按钮
Xradia 610 Versa EMO

Pressing the Emergency Off (EMO) button turns OFF:

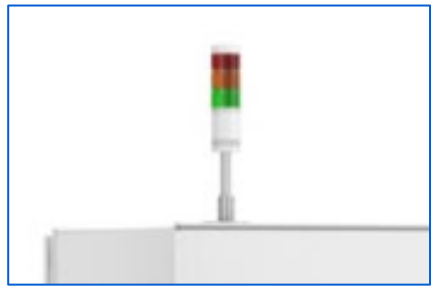
– All energy sources, including the X-ray source and high-voltage power supply

– All moving parts within the Xradia Versa, such as the motor control modules

– The ergonomic station

– The computer workstation, and if included, the optional storage server

Xradia 610 Versa 状态指示灯
Xradia 610 Versa light tower status



Light Tower Indicator Status	Description
All lights OFF	Power to the Xradia Versa is turned OFF.
Red light ON (top)	X-ray source is turned ON and X-rays are present within the enclosure.
Red light OFF (top)	X-ray source is turned OFF and X-rays are **not** present within the enclosure.
Amber light ON (center)	Access doors are CLOSED.
Amber light OFF (center)	Access doors are OPEN.
Green light ON (bottom)	Power to the Xradia Versa is turned ON.
Green light OFF (bottom)	Power to the Xradia Versa is turned OFF.

Xradia 610 Versa 安全连锁
Xradia 610 Versa Safety Interlock

The interlock electronics are located within the Power Distribution Unit (PDU), and are intended to serve as a safety circuit that protects the operator from exposure to X-rays (Refer to Figure J-1, and Figure J-2).

Three primary design requirements for the X-ray safety interlock circuit:

1. Redundancy – Two independent means to prevent X-ray generation

2. Fail-safe – A single component failure cannot result in a hazardous condition

3. Failure detection – A single component failure must be detected

There are four access doors located on the Xradia Versa enclosure. Each door has two normally closed dual-contact switches. The dual contacts from each door interlock switch are configured as two separate series circuits.

In this interlock scheme, there are two safety relays and one PLC. This can be thought of as one double-pole switch representing two series circuits for interlock-1 and two series circuits for interlock-2. When a door is opened, all four interlock circuits are open.

To satisfy redundancy, each safety relay receives the two series circuits from the door interlock switches and will only energize if both circuits are closed. The safety relays are configured with three-pole contacts. One contact for each of the two X-ray source types and one contact is monitored by the PLC (all three contacts must agree for the relay to remain energized).

The PLC monitors outputs from the two safety relays, ‘X-ray On’ status signal from the source, electrical current from the red ‘X-ray On’ status light, and a red reset switch (located on the front of the PDU). Outputs from the PLC control power to the safety relays and three status lights (Green-Power On, Yellow-Interlock Ok, and Red- X-ray On) (Refer to Table J-1 “Light Tower Indicator Status”). Two additional outputs drive ‘Interlock Error’ status lights (also located on the front of the PDU adjacent to the reset switch).

Xradia 610 Versa 安全连锁电路图
Xradia 610 Versa Safety Interlock Electrical Diagram